

Serial No. 09/851,313  
Docket No. NEC01P069-MSb

10

### REMARKS

A Petition and Fee for Two Month Extension of Time is filed with this Amendment.

Claims 1, 4-5, 8, 31, 34-35, 37-38 and 40-53 and 55-56 are all the claims presently pending in the present Application. Claims 1, 5, 35, 40-43, 46-49 and 51 have been amended to more particularly define the claimed invention. Claims 32, 36, 39 and 54 have been canceled.

It is noted that the amendments are made only to more particularly define the invention and not for distinguishing the invention over the prior art, for narrowing the scope of the claims, or for any reason related to a statutory requirement for patentability. It is further noted that, notwithstanding any claim amendments made herein, Applicant's intent is to encompass equivalents of all claim elements, even if amended herein or later during prosecution.

Claims 1, 5, 35, 41 and 42 stand rejected under 35 U.S.C. §112, second paragraph as being allegedly indefinite.

Claims 1, 4-5, 8, 31-32 and 34-56 stand rejected under 35 U.S.C. §103 (a) as being unpatentable over Yau et al. (US Patent No. 6,054,379) in view of Allada et al. (6,218,317 B1) and further in view of the Alleged Admitted Prior Art (AAPA).

These rejections are respectfully traversed in view of the following discussion.

#### **I. THE CLAIMED INVENTION**

The claimed invention (e.g., as recited, for example, in claim 1 and similarly recited in claims 5, 41-42 and 49) is directed to a semiconductor device including a multi-layered insulation film formed on a semiconductor substrate, and a plurality of wires which are formed in grooves formed in the multi-layered insulation film, the multi-layered insulation film filling a space between the wires.

The multi-layered insulation film includes a first insulation layer including an organosiloxane film having a dielectric constant which is lower than a silicon oxide dielectric constant, a second insulation layer comprising a polysiloxane compound having an Si-H group and formed on and adhering to a top of the organosiloxane film of the first insulation layer, and a third insulation layer comprising an inorganic material and formed on and adhering to a top of the second insulation layer.

Serial No. 09/851,313

11

Docket No. NEC01P069-MSb

Importantly, the organosiloxane film includes a methyl silsesquioxane (MSQ) layer, and the polysiloxane compound includes a methylated hydrogen silsesquioxane (MHSQ) layer which adheres to the MSQ layer and the inorganic material (Application at page 21, line 22-page 23, line 15; Figure 1).

Conventionally insulating layers may include an inorganic insulating layer (e.g., a silicon oxide layer) on an organic insulating layer. However, in devices formed by such conventional methods, during a subsequent planarizing step, peeling occurs at the interface between the organic and inorganic insulating layers, which can result in cross-talk between wires (e.g., wires which are separated by the insulating layers) in the semiconductor device (Application at Figure 5; page 2, lines 12-27; page 6, line 13 - Page 7, line 8). Other conventional insulating layers include BPSG (Application at Figure 9(b)), but BPSG has a poor gap-filling characteristic.

An exemplary aspect of the claimed invention, on the other hand, includes a multi-layered insulation film having a first insulation layer including an organosiloxane film which includes a methyl silsesquioxane (MSQ) layer, and the polysiloxane compound includes a methylated hydrogen silsesquioxane (MHSQ) layer which adheres to the MSQ layer and the inorganic material (Application at page 21, line 22-page 23, line 15; Figure 1).

The MHSQ layer of the multi-layered insulation film may help to improve adhesion between the MSQ layer and the inorganic material. (Application at page 25, lines 21-26).

## II. THE 35 USC 112, SECOND PARAGRAPH REJECTION

The Examiner alleges that claims 1, 5, 35 and 41-42 are indefinite. Applicant submits, however, that these claims are clearly defined and not indefinite.

Specifically, Applicant notes that claims 1, 5, 35 and 41-42 have been amended to address the Examiner's concerns.

In view of the foregoing, the Examiner is respectfully requested to withdraw this rejection.

Serial No. 09/851,313  
Docket No. NEC01P069-MSb

12

### III. ALLEGED PRIOR ART REFERENCES

The Examiner alleges that Yau would have been combined with Allada and the AAPA to form the invention of claims 1, 4-5, 8, 31-32 and 34-56. Applicant submits, however, that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention.

In contrast to Yau which is directed to a method of depositing an oxidized organo silane film, Allada is intended to address the problems involved with forming an undoped silicon glass (USG) hardmask on a polymer-insulated material without taking out a wafer from a spin-truck device, by producing multilayered wires in which both the hardmask and a layered insulation material are capable of being spin-coated. Further, in complete contrast to Yau and Allada, the AAPA simply teaches forming a silicon oxide film on a methyl silsesquioxane (MSQ) film 2 (Application at page 1, lines 16-21).

Thus, clearly Yau, Allada, and the AAPA have different problems and objects to be solved, and there clearly is no motivation to combine Yau, Allada, and the AAPA as alleged by the Examiner. In short, Applicant respectfully submits that these references are unrelated, and no person of ordinary skill in the art would have considered combining these disparate references, absent impermissible hindsight.

In fact, Applicant submits that the references provide no motivation or suggestion to urge the combination as alleged by the Examiner. Indeed, these references clearly do not teach or suggest their combination. Therefore, Applicant respectfully submits that one of ordinary skill in the art would not have been so motivated to combine the references as alleged by the Examiner. Therefore, the Examiner has failed to make a prima facie case of obviousness.

Moreover, neither Yau, nor Allada, nor the AAPA, nor any alleged combination thereof teaches or suggests "*wherein said organosiloxane film comprises a methyl silsesquioxane (MSQ) layer, and said polysiloxane compound comprises a methylated hydrogen silsesquioxane (MHSQ) layer which adheres to said MSQ layer and said inorganic material*", as recited in claim 1 and similarly recited in claims 5, 41, 42 and 49 (Application at page 16, lines 8-21; Figure 3(b)).

As noted above, the MHSQ layer of the multi-layered insulation film may help to

Serial No. 09/851,313

13

Docket No. NEC01P069-MSb

improve adhesion **between the MSQ layer and the inorganic material.** (Application at page 25, lines 21-26).

Clearly, these features are not taught or suggested by the cited references.

Indeed, in the claimed invention, an MHSQ layer may be provided between a MSQ layer and an inorganic material layer in order to improve adhesion therebetween.

In contrast, Yau discloses parylene, FSG and silicon oxide as an initial first intermetal dielectric layer 710 (Yau at col. 13, lines 12-13). Even assuming (arguendo) that the initial first intermetal dielectric layer in Yau somehow corresponds to the first insulation layer in the claimed invention, the structure disclosed in Yau is completely different from the claimed invention in which the first insulation layer includes an organosiloxane film including an MSQ layer.

In fact, parylene is an organic material that does not contain silicon (Si), and FSG is a fluorine-containing silicon oxide. These materials (e.g. parylene, FSG and silicon oxide) are different from MSQ. Further Yau only discloses an "oxidized organo silane layer" as an adhesive layer.

Further, Allada only shows the use of methylated oxide-type materials such as HOSP in place of undoped silicon glass (USG) as a hard mask. Even if MSQ is used as the methylated oxide type materials, Allada does not teach or suggest the structure of the multi-layered insulation film of the claimed invention. Therefore, Allada clearly does not make up for the deficiencies in Yau.

Moreover, Applicant would point out that no suggestion or motivation exists to combine Yau with Allada in order to improve adhesion between a MSQ layer and an inorganic material layer, and even if combined, the combination would not teach or suggest each and every feature of the claimed invention.

That is, the Examiner surprisingly attempts to equate layer 710 (e.g., perylene) in Yau with the first insulation layer of the claimed invention. However, Applicant would point out that Yau merely mentions parylene, FSG, or silicon oxide as a first insulation layer 710 (e.g., see Yau at col. 13, line 13). Parylene is an organic layer (which does not contain Si), and FSG is a silicon oxidized layer which contains fluorine. Therefore, layer 710 in Yau (which the Examiner alleges corresponds to the first insulation layer of the claimed invention) is clearly different from the first

Serial No. 09/851,313

14

Docket No. NEC01P069-MSb

insulation layer of the claimed invention which includes an organosiloxane (e.g., a silicone-like compound which contains organics) including an MSQ layer. That is, Yau clearly does not teach or suggest a first insulation layer including an organosiloxane film including an MSQ layer.

Further, the Examiner concedes that Yau does not teach or suggest a multi-layered insulation film including a second insulation layer including an MHSQ layer. Moreover, nowhere does Yau teach or suggest a first insulation layer including an organosiloxane film which includes a methyl silsesquioxane (MSQ) layer, and a polysiloxane compound (e.g., in a second insulation layer) including a methylated hydrogen silsesquioxane (MHSQ) layer which adheres to the MSQ layer and the inorganic material (Application at page 21, line 22-page 23, line 15; Figure 1).

Likewise, Allada does not teach or suggest these features of the claimed invention. Indeed, Allada simply teaches a methylated hardmask 18 formed on a polymeric interlayer 16 (Allada at Figure 1b). That is, even assuming (arguendo) that the methylated hardmask 18 may be somehow equated with the MHSQ layer of the claimed invention (as alleged by the Examiner), like Yau, Allada does not teach or suggest a multi-layered insulation film including a first insulation layer including an organosiloxane film which includes a methyl silsesquioxane (MSQ) layer, and a polysiloxane compound (e.g., in a second insulation layer) including a methylated hydrogen silsesquioxane (MHSQ) layer which adheres to the MSQ layer and the inorganic material (Application at page 21, line 22-page 23, line 15; Figure 1).

Thus, Allada certainly does not make up for the deficiencies in Yau.

Likewise, the AAPA does not teach or suggest these features of the claimed invention. Indeed, the Examiner surprisingly attempts to rely on Figures 8-9 and page 4, line 1-page 6, line 13 of the present Application to support his arguments. However, the Examiner is clearly incorrect.

In fact, Figures 8-9 of the present Application simply depict a conventional device including an insulation layer 55 which is formed of BPSG. Nowhere in Figures 8 and 9 or anywhere else, does the AAPA teach or suggest a first insulation layer including an organosiloxane film which includes a methyl silsesquioxane (MSQ) layer, and a polysiloxane compound (e.g., in a second insulation layer) including a methylated hydrogen silsesquioxane

Serial No. 09/851,313

15

Docket No. NEC01P069-MSb

**(MHSO) layer which adheres to the MSQ layer and the inorganic material** (Application at page 21, line 22-page 23, line 15; Figure 1).

Therefore, neither Allada nor the AAPA make up for the deficiencies in Yau.

Therefore, Applicant respectfully submits that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention. Therefore, the Examiner is respectfully requested to withdraw this rejection.

#### **IV. FORMAL MATTERS AND CONCLUSION**

In response to the Examiner's objections to claims 39, 43 and 48, Applicant notes that claim 39 has been canceled and claims 43 and 48 have been amended to address the Examiner's concerns. Applicant notes that claim 47 has been amended to address the Examiner's objection thereto.

In view of the foregoing, the Examiner is respectfully requested to withdraw these objections.

In view of the foregoing, Applicant submits that claims 1, 4-5, 8, 31, 34-35, 37-38 and 40-53 and 55-56, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

Serial No. 09/851,313  
Docket No. NEC01P069-MSb

16

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully submitted,

Date: 4/19/07

Phillip E. Miller, Esq.  
Reg. No. 46,060

**McGinn IP Law Group, PLLC**  
8321 Old Courthouse Rd., Suite 200  
Vienna, Virginia 22182  
(703) 761-4100  
Customer No. 21254

**CERTIFICATE OF FACSIMILE TRANSMISSION**

I hereby certify that the foregoing was filed by facsimile with the United States Patent and Trademark Office, Examiner Julio Maldonado, Group Art Unit #2823 at fax number 571-273-8300 this 19th day of April, 2007.



Phillip E. Miller  
Reg. No. 46,060